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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the phase change mold optical recording medium which can perform informational record playback and can be rewritten by irradiating a light beam at a record ingredient and making this record ingredient produce an optical change. This invention relates to the structure (the 1st invention) of the optical recording medium which can shorten the membrane formation time amount at the time of manufacture in more detail. Moreover, this invention relates to the phase change mold optical recording medium (the 2nd invention and the 3rd invention) which raised the count of rewriting, and recording density.
[0002]
[Description of the Prior Art] As one of the optical recording media (optical information record medium) which enable the informational record playback and informational rewriting by the exposure of laser light, the phase change mold optical recording medium using optical constant change accompanying the structural change between crystal-amorphous is known well, and CD-RW, DVD-RW, etc. are already put in practical use.
[0003] Generally these optical recording media are ZnS-SiO2 on transparent plastic plates, such as a polycarbonate. A protective layer (lower dielectric protective layer), an AgInSbTe system phase change mold recording layer, and ZnS-SiO2 It is having structure which carried out the laminating of the four layers of a protective layer (up dielectric protective layer) and aluminum alloy system reflective heat dissipation layer. here -- ZnS-SiO2 from -- although it is common to set thickness to 50nm or more as for the becoming lower dielectric protective layer (transparence substrate side), forming by the sputtering method takes time amount. Moreover, ZnS-SiO2 SiO2 It was a problem that there is much originating raising dust and the maintenance frequency of a sputtering system is large.
[0004] Moreover, generally the optical disk of a phase change mold like CD-RW among optical recording media is ZnS-SiO2 on a plastic plate. It is [a layer and / a chalcogen system phase change mold recording layer and] ZnS-SiO2 on it on it. It has a layer and structure which carried out the laminating of the four layers of aluminum system alloy layer on it.
[0005] However, in order that the rewritable optical disc of a phase change mold might heat and might fuse and record record film, when many rewritings were performed, it had the trouble that the defect in the film increased and an error became easy to increase.
[0006]
[Problem(s) to be Solved by the Invention] It was made in view of the above-mentioned trouble, the purpose has a late spatter rate in a phase change mold optical recording medium, and this invention (the 1st invention) is SiO2 of ZnS-SiO2 with much raising dust. While making a spatter rate quick by reducing an amount, it is in decreasing the amount of raising dust at the time of a spatter.
[0007] Moreover,.this invention (the 2nd invention and the 3rd invention) was made in view of the above-mentioned trouble, and is for the purpose to raise the count of rewriting and recording density in the rewritable phase-change optical disk of CD-RW, DVD-RW, DVD+RW, etc.

[0008]
[Means for Solving the Problem] Claims 9-13 require the 2nd invention, and claims 14-18 require for the 1st invention claims 1-8 shown below at the 3rd invention, respectively. An optical recording medium according to claim 1 is further set to a phase change mold recording layer and its upper part with a lower dielectric protective layer on a transparence substrate at the upper part on an up dielectric protective layer and the phase change mold optical recording disk of the structure which carried out the laminating of the reflective heat dissipation layer to the upper part. A lower dielectric protective layer is ZnS-SiO2 formed on the transparence substrate. The 1st transparence dielectric with a quick membrane formation rate (transparence dielectric by the side of a transparence substrate), It is characterized by consisting of two-layer [of the 2nd transparence dielectric (transparence dielectric by the side of a phase change mold recording layer) which has ZnS-SiO2, the EQC, or the thermal conductivity not more than it formed in the upper part].
[0009] In this invention (the 1st invention), a lower protective layer is made two-layer. It is ZnS or SiO2 to a transparence substrate side. ZnS-SiO2 below 10mol% A transparent membrane (transparence dielectric film) is used. Next, the transparent membrane of nitriding germanium systems, such as GeCrNx, is prepared.
[0010] ZnS-SiO2 It sets and is SiO2. If the rate is reduced, since a refractive index will become large, required thickness can be reduced. Moreover, a membrane formation rate also increases in monotone. However, for ZnS, the heat conductivity in being the crystal film and being the very soft film is also ZnS-SiO2. Since it is large, the count of over-writing of an optical recording medium decreases remarkably. If there are many amounts of heat transfer by heat conduction, many heat will flow to a substrate and substrate deformation will arise. Moreover, it is a crystalline substance, and change of a phase change mold recording layer takes place early owing to a soft thing, and property degradation progresses quickly. Furthermore, the moisture-proof protection capacity of a phase change mold recording layer is inferior, and preservation dependability falls. Then, between a phase change mold recording layer and a ZnS layer, the optical recording medium of this invention is amorphous, and the fault which ZnS has is compensated with it by inserting the dielectric of a precision and GeNx system with thermal conductivity low moreover (x is changed on membrane formation conditions).
[0011] In claim 1, the 1st transparence dielectric is ZnS and an optical recording medium according to claim 2 is characterized by the 2nd transparence dielectric being GeCrNx.
[0012] An optical recording medium according to claim 3 is characterized by the 2nd transparence dielectric being GeTiNx in claim 1.
[0013] An optical recording medium according to claim 4 is characterized by the 2nd transparence dielectric being GeYNx in claim 1.
[0014] An optical recording medium according to claim 5 is characterized by the 2nd transparence dielectric being GeZrNx in claim 1.
[0015] An optical recording medium according to claim 6 is characterized by the 2nd transparence dielectric being GeNbNx in claim 1.
[0016] An optical recording medium according to claim 7 is characterized by the 2nd transparence dielectric being GeTaNx in claim 1.
[0017] An optical recording medium according to claim 8 is characterized by a phase change mold recording layer consisting of an ingredient (for example, AgInSbTe) of a melting elimination mold in either of claims 1-7.
[0018] An optical recording medium according to claim 9 is further set [a phase change mold recording layer and its upper part] with a lower dielectric protective layer on a transparence substrate at the upper part to an up dielectric protective layer and the phase change mold optical recording medium of the structure which carried out the laminating of the reflective heat dissipation layer to the upper part. An up dielectric protective layer The 1st up dielectric protective layer by the side of a phase change mold recording layer, Consisting of the 2nd up dielectric protective layer by the side of a reflective heat dissipation layer, this 2nd up dielectric protective layer is ZnS-SiO2. It is characterized by for thermal conductivity consisting of a high ingredient and a reflective heat dissipation layer consisting of an

ingredient with thermal conductivity higher than aluminum.

[0019] An optical recording medium according to claim 10 is characterized by for the thermal conductivity of the 2nd up dielectric protective layer being 0.15 or more W/mK, and the thermal conductivity of a reflective heat dissipation layer being 3 or more W/mK in claim 9.

[0020] An optical recording medium according to claim 11 is characterized by the 2nd up dielectric protective layer consisting of SiC, B4 C, AlN, BN and SiN, TaNx, ZnO and aluminum 2O3, Y2 O3, either of the MgO(s), or its mixture in claim 10.

[0021] an optical recording medium according to claim 12 -- claim 10 -- setting -- a reflective heat dissipation layer -- Ag -- 50at(s)% (atomic %) -- it is characterized by containing above.

[0022] An optical recording medium according to claim 13 is characterized by a phase change mold recording layer consisting of AgInSbTeGe in claims 10, 11, or 12.

[0023] An optical recording medium according to claim 14 on a transparence substrate in a reflective heat dissipation layer and its upper part A lower dielectric protective layer, In the phase change mold optical recording medium of the structure which carried out the laminating of the cover layer to the upper part further with the up dielectric protective layer in a phase change mold recording layer and its upper part at the upper part A lower dielectric protective layer consists of the 1st lower dielectric protective layer by the side of a reflective heat dissipation layer, and two-layer [of the 2nd lower dielectric protective layer by the side of a phase change mold recording layer]. And the 1st lower dielectric protective layer is ZnS-SiO2. It is characterized by for thermal conductivity consisting of a high ingredient and a reflective heat dissipation layer consisting of an ingredient with thermal conductivity higher than aluminum.

[0024] In claim 14, the thermal conductivity of the 1st lower dielectric protective layer is 0.15 or more W/mK, and an optical recording medium according to claim 15 is characterized by the thermal conductivity of a reflective heat dissipation layer being 3 or more W/mK.

[0025] An optical recording medium according to claim 16 is characterized by the 1st lower dielectric protective layer consisting of SiC, B4 C, AlN, BN and SiN, TaNx, ZnO and aluminum 2O3, Y2 O3, either of the MgO(s), or its mixture in claim 14.

[0026] an optical recording medium according to claim 17 -- claim 14 -- setting -- a reflective heat dissipation layer -- Ag -- more than 50at% -- it is characterized by containing.

[0027] An optical recording medium according to claim 18 is characterized by a phase change mold recording layer consisting of AgInSbTeGe in claims 15, 16, or 17.

[0028] In the optical recording medium of this invention (the 2nd invention), an up dielectric layer is made two-layer in the optical recording medium of the structure which carried out the laminating of a transparence substrate, a lower dielectric protective layer, a phase change mold recording layer, an up dielectric protective layer, and the reflective heat dissipation layer to this order. In this case, the 1st up dielectric protective layer which is in contact with the phase change mold recording layer (it may be hereafter written as a recording layer or record film) lessens the amount of thermal conduction, and the 2nd up dielectric protective layer which is in contact with the reflective heat dissipation layer makes [many] the amount of thermal conduction. Specifically in the layer of low-fever conductivity, it is ZnS-SiO2. The simple substance or mixture of SiC or AlN is used for the layer of high temperature conductivity using ZnS. Moreover, a reflective heat dissipation layer is formed with a thermally conductive good alloy. As this alloy, the thing of Ag, Cu, and Au system is desirable, for example.

[0029] Moreover, in the optical recording medium of this invention (the 3rd invention), in the optical recording medium of the structure which carried out the laminating of a transparence substrate, a reflective heat dissipation layer, a lower dielectric protective layer, a phase change mold recording layer, and the up dielectric protective layer to this order, while making a lower dielectric layer two-layer The 2nd lower dielectric protective layer which is in contact with the phase change mold recording layer lessens the amount of thermal conduction like the 2nd invention, and the 1st lower dielectric protective layer which is in contact with the reflective heat dissipation layer makes [many] the amount of thermal conduction.

[0030] By this invention (the 2nd invention and the 3rd invention), the highest attainment temperature of record film becomes low because heat conduction of a reflective heat dissipation layer becomes good. For this reason, degradation of record film is suppressed and the count of repeat rewriting improves. However, it may also happen to have said that record sensibility worsened only by improving heat conduction of a reflective heat dissipation layer. Then, temperature of record film is made easy to divide the dielectric protective layer between a recording layer and a reflective heat dissipation layer into two, to give adiathermic to the ingredient of the dielectric protective layer of the side which is in contact with the recording layer, and to go up at the time of record. And when holding a certain fixed time amount elevated temperature, the heat of record film is quickly taken through the dielectric protective layer of the direction with sufficient heat conduction, and it is made to flow in a reflective heat dissipation layer. Consequently, a cooling rate becomes large, even if the attainment temperature of a phase change mold recording layer is lower, the big temperature gradient per unit time amount required for amorphous-izing of a recording layer can be acquired, and record sensibility improves.

[0031] Each of SiC, B4 C, AlN, BN and SiN, TaNx, ZnO and aluminum 2O3, Y2 O3, and MgO(s) is ZnS-SiO2. It has high thermal conductivity. If it is as he wants to obtain an only high cooling rate, it can cover with a dielectric with low thermal conductivity thinly, and a reflective heat dissipation layer can also be formed after it. However, since optical thickness becomes small in that case, the modulation factors of a signal will run short. Since a certain amount of optical thickness is required for the up dielectric protective layer between a phase change mold recording layer and a reflective heat dissipation layer (transparent membrane), an opposite problem [say / thicker optical thickness and good heat conduction] exists. In order that this invention may solve this trouble and may reconcile thicker optical thickness and good heat conduction, the description is that it formed the up dielectric protective layer in two layers from which a heat characteristic differs mutually.

[0032]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained based on a drawing.

The gestalt of the 1st operation (the 1st invention)

Drawing 1 is the sectional view showing the laminated structure of an optical recording medium (phase-change optical disk). On the plastic plate 1, as a lower dielectric protective layer, this optical recording medium carries out the membrane formation laminating of the 1st lower dielectric protective layer 2 and the 2nd lower dielectric protective layer 3, the phase change mold recording layer 4, the up dielectric protective layer 5, and the reflective heat dissipation layer 6 to this order, through the resin glue line 7, sticks the substrate (substrate for lamination) 8 of the other party, and is constituted at this reflective heat dissipation layer 6 top.

[0033] The above-mentioned optical recording medium is a lower dielectric protective layer ZnS-SiO2 The 1st transparence dielectric 2 with a quick membrane formation rate (transparence dielectric by the side of a transparence substrate), and ZnS-SiO2 formed on it The description is that it consists of two-layer [of the 2nd transparence dielectric (transparence dielectric by the side of a phase change mold recording layer) 3 which has an EQC or the thermal conductivity not more than it].

[0034] As an optical recording medium of a laminated structure shown in drawing 1 , the transparence dielectric protective layer 2 of the (a) above 1st is ZnS. that whose 2nd transparence dielectric 3 is GeCrNx, and (b) -- that whose 2nd transparence dielectric protective layer 3 is GeTiNx -- (c) -- that whose 2nd transparence dielectric protective layer 3 is GeYNx, and (d) -- that whose 2nd transparence dielectric protective layer 3 is GeZrNx -- (e) -- that whose 2nd transparence dielectric protective layer 3 is GeNbNx, and (f) -- that whose 2nd transparence dielectric protective layer 3 is GeTaNx, and thing ** which (g) phase change phase change mold recording layer becomes from the ingredient of a melting elimination mold are mentioned. As this melting elimination type of a phase change record ingredient, the thing of an AgInSbTe system and the thing of an InSbTe system are mentioned, for example.

[0035] Gestalt drawing 2 of the 2nd operation is the sectional view showing the fundamental configuration of the optical disk of a mold in which light carries out incidence through a substrate among the record mold optical disks concerning this invention. As shown in this drawing 2 , this optical disk consists of the lower dielectric protective layer 12 by which sequential formation was carried out on the plastic plate 11, the phase change mold recording layer 13, the 1st up dielectric protective layer 14, the 2nd up dielectric protective layer 15, a reflective heat dissipation layer 16, a resin glue line 17, and a dummy substrate 18 for lamination.

[0036] For the thickness of each class, at DVD system media using 635nm light although optimized from an optical and thermal property, the lower dielectric protective layer 12 is ZnS-SiO2. Although thickness is made into about 50 - 250nm of abbreviation when it is the dielectric of the refractive-index 2 neighborhood [like], 50-80nm or about 160-220nm are desirable. Although it is desirable that it will not be finely concerned with an AgInSbTe system, a GeSbTe system, etc. for a line crack or cone reason if mark formation is a chalcogen system, but the direction of quenching structure sets thickness to 8-30nm by the thermal reason as for the phase change mold recording layer 13, 13-22nm is more desirable.

[0037] The 1st and 2nd up dielectric protective layer 14 and 15 must also lead heat to the reflective heat dissipation layer 16, and cannot make thickness not much thick. The thickness of these up dielectric protective layers 14 and 15 has desirable about 7-60nm in total, and its 10-30nm is more desirable. In the 1st up dielectric protective layer 14 with the low heat conductivity, if there is about 2-5nm of thickness, a disk property will improve. About the thickness of the reflective heat dissipation layer 16, although it is good, heat dissipation nature is improved, and 80nm or less, then in order to raise the dependability of rewriting repeatedly, 100-200nm is desirable in the thickness with which a reflection factor is saturated.

[0038] Gestalt drawing 3 of the 3rd operation is the sectional view showing the fundamental configuration of a record mold optical disk. On the plastic plate 21, the laminating of this optical disk is carried out to the order of the reflective heat dissipation layer 22, the 1st lower dielectric protective layer 23, the 2nd lower dielectric protective layer 24, the phase change mold recording layer 25, the up dielectric protective layer 26, and the ultraviolet-rays hardening resin cover layer 27, and it is constituted.

[0039]

[Example] Hereafter, the example and the example of a comparison of this invention are explained, referring to a drawing. In addition, examples 1-6 (drawing 1) are [0040] which is what examples 7-13 (drawing 2) require for the 2nd invention, and examples 14-18 (drawing 3) require for the 1st invention at the 3rd invention, respectively. The optical recording medium which has the cross-section structure shown in example 1 drawing 1 was produced. On the polycarbonate substrate which has a guide rail as a plastic plate 1, by the sputtering method (1) It is the 1st transparence dielectric (1st lower dielectric protective layer) 2 and the dielectric of (2) nitriding germanium system which consist of ZnS. (germanium80Cr20wt%) Membranes were formed in order of the 2nd transparence dielectric (2nd lower dielectric protective layer) 3 which consists of Nx, (3) phase change mold recording layer 4, (4) up dielectric protective layer 5, and (5) reflective heat dissipation layer 6.

[0041] In this case, what is shown in following [table 1] as an ingredient of each class was used. in addition, GeCrNx 80wt(s)% and whose Cr germanium of Nx (germanium80Cr20wt%) is the compounds of 20wt(s)% GeCr and Nx -- Sb means and Te means [Ag / In] 29at(s)% AgInSbTe 58at(s)% 8at(s)% 5at(s)% Ag5In8Sb58Te29at%, respectively. Moreover, ZnS-20mol%SiO2 SiO2 20-mol% of ZnS-SiO2 As for aluminum-1wt%Ti, Ti means 1wt% AlTi, respectively.

[0042]

[Table 1]

	実施例１	実施例２
第１の下部誘電体保護層２　７０ｎｍ	ＺｎＳ	ＺｎＳ
第２の下部誘電体保護層３　１０ｎｍ	（Ｇｅ８０Ｃｒ２０ｗｔ％）Ｎｘ	（Ｇｅ８０Ｔｉ２０ｗｔ％）Ｎｘ
相変化型記録層４　２０ｎｍ	Ａｇ５Ｉｎ８Ｓｂ５８Ｔｅ２９ａｔ％	Ａｇ５Ｉｎ８Ｓｂ５８Ｔｅ２９ａｔ％
上部誘電体保護層５　２０ｎｍ	ＺｎＳ－２０ｍｏｌ％ＳｉＯ２	ＺｎＳ－２０ｍｏｌ％ＳｉＯ２
反射放熱層６　１４０ｎｍ	Ａｌ－１ｗｔ％Ｔｉ	Ａｌ－１ｗｔ％Ｔｉ
下部誘電体成膜時の投入熱量　ｋＷ・ｓ	２７	２７
１０００回書き換え後の信号	○	○
８０℃・３００時間保存後の特性	○	○

（１）信号記録再生：６６０ｎｍ、ＮＡ０．６５の光ピックアップを使用した。
（２）０．２６７ｕｍ／ｂｉｔのＥＦＭ＋信号を記録した。
（３）クロックと信号の間のジッターが１２％未満のものを○とし、１２％以上のものを×とした。
（４）８０℃・３００時間の保存試験では、記録されたＥＦＭ＋信号のジッターが、３００時間後において１２％未満のものを○とし、１２％以上を×とした。

[0043] With the spin coat method, the resin glue line (UV resin) 7 was applied on the above-mentioned reflective heat dissipation layer 6. And it considered as the optical recording medium by sticking the polycarbonate substrate which carried out the laminating of above-mentioned each class with the polycarbonate substrate of the other party.
[0044] The single-wafer-processing sputtering system was used in the above-mentioned sputtering. The membrane formation conditions of each class were carried out as follows.
(A) Membrane formation and 4 kW-Ar gas pressure 3mbar of the 1st transparence dielectric 2 (300Pa)
(B) Membrane formation and the rate 0.4 (volume ratio) of a 1.5 kW-Ar+N gas pressure 3 mbar-N/Ar gas ratio of the 2nd transparence dielectric 3
(C) a phase change mold recording layer and 0.3 kW-Ar gas pressure 3mbar(D) up dielectric protective layer and 3 kW-Ar gas pressure -- a 3mbar(E) reflective heat dissipation layer and 4 kW-Ar gas pressure 3mbar [0045] Each membrane formation thickness changes with reflection factors required of an optical recording medium as the wavelength of the laser to be used. the case where the DVD-RW system using the wavelength near 660nm is considered -- a lower dielectric protective layer (the 1st, 2nd transparence dielectric) -- the refractive index of this lower protective layer, and the product of thickness (nm) -- about 20- as for good ****, the 25 neighborhoods, or especially the 35 neighborhoods, being referred to as about 45 is desirable. The thickness of a phase change mold recording layer has desirable 10-30nm, and especially near 20nm is desirable. It is desirable that the products of a refractive index and thickness (nm) are 5-20, and an up dielectric protective layer has the nine desirable neighborhoods, especially when it is a DVD system. The thickness of a reflective heat dissipation layer has good about 100-200nm. To the above [Table 1], the injection heating value and signal property at the time of the lower dielectric membrane formation in this example 1 were written together.
[0046] Like [it is ****** with the above [Table 1], and], substrate deformation is suppressed and the one where the heat at the time of membrane formation is smaller can manufacture an optical recording medium under a quicker baton. Moreover, an ingredient with the quicker spatter rate of membrane formation can make the product of power and time amount small. Since it is generally proportional to the power at the time of sputtering, and the product of time amount, the injection heating value of a substrate is used as a simple index.
[0047] In a sputtering system, if a membrane formation room is not cleaned periodically, the defect of the produced optical recording medium will increase. When the 1st lower dielectric protective layer 2 is set to ZnS, it is conventional ZnS-20mol%SiO2. It was able to compare and the time amount to cleaning was able to be extended to about 1.4 times. Moreover, at the 2nd lower dielectric protective layer 3 of an

example 1, the fluctuation of the signal of an optical recording medium decreased by adding Cr to this on the basis of GeNx. This is considered because thermal conductivity became smaller than GeNx.
[0048] the two to example 6 above [Table 1], and the following -- as shown in [Table 2] and [Table 3], even if there were few 1st lower dielectric protective layers 2 and 2nd lower dielectric protective layers 3 either, the optical recording medium was produced on the same conditions as an example 1 except having differed one ingredient in the example 1. For example, in the example 4, the ingredient of the 1st lower dielectric protective layer 2 was set to ZnSe, and the ingredient of the 2nd lower dielectric protective layer 3 was set to Nx (germanium80Y20wt%). Thus, in the 2nd lower dielectric protective layer of examples 2-6, when Ti, Zr, Y, Nb, and Ta were added to this on the basis of GeNx, the fluctuation of the signal of an optical recording medium decreased. This is considered because thermal conductivity became smaller than GeNx.
[0049]
[Table 2]

	実施例3	実施例4
第１の下部誘電体保護層２　７０ｎｍ	ＺｎＳ	ＺｎＳｅ
第２の下部誘電体保護層３　１０ｎｍ	（Ｇｅ８０Ｚｒ２０ｗｔ％）Ｎｘ	（Ｇｅ８０Ｙ２０ｗｔ％）Ｎｘ
相変化型記録層４　２０ｎｍ	Ａｇ５Ｉｎ８Ｓｂ５８Ｔｅ２９ａｔ％	Ａｇ５Ｉｎ８Ｓｂ５８Ｔｅ２９ａｔ％
上部誘電体保護層５　２０ｎｍ	ＺｎＳ－２０ｍｏｌ％ＳｉＯ２	ＺｎＳ－２０ｍｏｌ％ＳｉＯ２
反射放熱層６　１４０ｎｍ	Ａｌ－１ｗｔ％Ｔｉ	Ａｌ－１ｗｔ％Ｔｉ
下部誘電体成膜時の投入熱量　ｋＷ・ｓ	２７	２７
１０００回書き換え後の信号	○	○
８０℃・３００時間保存後の特性	○	○

[0050]
[Table 3]

	実施例5	実施例6
第１の下部誘電体保護層２　７０ｎｍ	ＺｎＳ－５ｍｏｌ％ＳｉＯ２	ＺｎＳ－９ｍｏｌ％ＳｉＯ２
第２の下部誘電体保護層３　１０ｎｍ	（Ｇｅ８０Ｎｂ２０ｗｔ％）Ｎｘ	（Ｇｅ８０Ｔａ２０ｗｔ％）Ｎｘ
相変化型記録層４　２０ｎｍ	Ａｇ５Ｉｎ８Ｓｂ５８Ｔｅ２９ａｔ％	Ａｇ５Ｉｎ８Ｓｂ５８Ｔｅ２９ａｔ％
上部誘電体保護層５　２０ｎｍ	ＺｎＳ－２０ｍｏｌ％ＳｉＯ２	ＺｎＳ－２０ｍｏｌ％ＳｉＯ２
反射放熱層６　１４０ｎｍ	Ａｌ－１ｗｔ％Ｔｉ	Ａｌ－１ｗｔ％Ｔｉ
下部誘電体成膜時の投入熱量　ｋＷ・ｓ	３０	３２
１０００回書き換え後の信号	○	○
８０℃・３００時間保存後の特性	○	○

[0051] In addition, in the [Table] which carries out the following, the approach, conditions, and valuation basis of a characteristic test of an optical recording medium are the same as that of [Table 1].
[[Table]] [[Table 2, 3, and 4] (example 1 of a comparison)]
[0052] The optical recording medium was produced on the conditions shown in example of comparison 1 following [table 4]. namely, the optical recording medium of the structure shown in drawing 1 -- setting -- a polycarbonate substrate top -- ZnS-20mol%SiO2 of 80nm of thickness from -- with the becoming lower dielectric protective layer The phase change mold recording layer which consists of

AgInSbTe (Ag5at% and In8at% and Sb58at% and Te29at%) of 20nm of thickness, ZnS-20mol%SiO2 of 20nm of thickness from -- sputtering membrane formation of the becoming up protective layer and the reflective heat dissipation layer which consists of aluminum-1wt%Ti was carried out, respectively.
[0053]
[Table 4]

		比較例１
第１の下部誘電体保護層２	７０ｎｍ	ＺｎＳ－２０ｍｏｌ％ＳｉＯ$_2$
第２の下部誘電体保護層３	１０ｎｍ	ＺｎＳ－２０ｍｏｌ％ＳｉＯ$_2$
相変化型記録層４	２０ｎｍ	Ａｇ５Ｉｎ８Ｓｂ５８Ｔｅ２９ａｔ％
上部誘電体保護層５	２０ｎｍ	ＺｎＳ－２０ｍｏｌ％ＳｉＯ$_2$
反射放熱層６	１４０ｎｍ	Ａｌ－１ｗｔ％Ｔｉ
下部誘電体成膜時の投入熱量	ｋＷ・ｓ	３３
１０００回書き換え後の信号		○
８０℃・３００時間保存後の特性		○

[0054] Consequently, membrane formation of a lower dielectric protective layer took 33 kW-s, and injection heat was large compared with examples 1-6. Signal degradation by repeat rewriting did not have examples 1-6 and a difference. An AgInSbTe system phase change mold recording layer is ZnS-20mol%SiO2. Especially the bad influence with sulfur does not win popularity. therefore, ZnS-SiO2 from -- a GeNx system ingredient is required as a barrier with the phase change mold recording layer which consists of a becoming lower dielectric protective layer and AgInSbTe -- dividing -- coming out -- there is nothing.
[0055] The 1st lower dielectric protective layer which consists of ZnS of 70nm of thickness on a polycarbonate substrate in the optical recording medium of the structure shown in example of comparison 2 drawing 1 , The 2nd lower dielectric protective layer which consists of GeCrNx of 10nm of thickness, and the phase change mold recording layer which consists of GeSbTe (germanium21at% and Sb25at% and Te44at%) of 20nm of thickness, ZnS-20mol%SiO2 of 30nm of thickness from -- sputtering membrane formation of the becoming up dielectric protective layer and the reflective heat dissipation layer which consists of aluminum-1wt%Ti was carried out, respectively.
[0056] When the EFM+ signal of shortest record mark length (3T) 0.5um was repeated by record pickup of 660nm and NA0.65 as a result and record playback was carried out, a drop out began to occur rapidly to a signal in about 5000 times, and it became use impossible. Originally the GeSbTe system should have the count of repeat rewriting tens of thousands times or more.
[0057] The phase change mold record ingredient with which an elimination process [like a GeSbTe system] this [whose] is is performed by solid phase shows that thermal optimization is difficult. The ingredient which once carries out melting altogether also in any of an elimination process like an AgInSbTe system and a record process shows that the optimal width of face of a membranous thermal design is narrow, and application of this invention is a little difficult by the GeSbTe system, although a property does not deteriorate so much even if it makes it membrane structure in which thermal conductivity differs from the former like this invention.
[0058] example of comparison 3 drawing 1 -- a polycarbonate substrate top -- ZnS-20mol%SiO2 of 70nm of thickness from -- with the 1st becoming lower dielectric protective layer The 2nd lower dielectric protective layer which consists of GeCrNx of 10nm of thickness, and the phase change mold recording layer which consists of AgInSbTe (Ag5at% and In8at% and Sb58at% and Te29at%) of 20nm

of thickness, ZnS-20mol%SiO2 of 20nm of thickness from -- sputtering membrane formation of the becoming up protective layer and the reflective heat dissipation layer which consists of aluminum-1wt% Ti was carried out, respectively.

[0059] The 1st and 2nd lower dielectric protective layer was used as the ingredient with low thermal conductivity, and made small the amount of heat transfer to a substrate. The count of repeat rewriting was about 1000 times, and was equivalent to examples 1-6. In this case, although the property was equivalent, the spatter time amount of the 1st lower dielectric protective layer would increase, therefore the thermal stress to a substrate will increase, and it was not desirable.

[0060] It formed by 70nm of thickness by setting an example of comparison 4 lower dielectric protective layer only to ZnS, and also the optical recording medium was produced like the example 1. The count of repeat rewriting was less than 500 times. Moreover, after 80 degree C and a 300-hour retention test, the jitter became 12% or more.

[0061] Example 7 (thing concerning the gestalt of the 2nd operation)
The laminated structure produced the optical disk shown by drawing 2 . As a plastic plate 11, thickness prepared the polycarbonate substrate which is 0.6mm, used magnetron sputtering equipment on this substrate, formed each class, and produced the optical disk. The ingredient of the lower dielectric protective layer 12 and the 1st up dielectric protective layer 14 is ZnS-SiO2 with low thermal conductivity. It carried out. For ZnS, in these layers, 80-mol % and thermal conductivity were [0.04 W/mK and thickness of the presentation] 70nm.

[0062] the ingredient of the phase change mold recording layer 13 -- 2at(s)%, 71at(s)%, Te set 20at(s)%, germanium set to 2at(s)% AgInSbTeGe, and In set [Ag / Sb] thickness to 20nm.5at(s)%. The ingredient of this presentation has a quick crystallization rate, and fits high linear velocity record. However, since there is much Sb, the optical constant change between an amorphous substance and a crystalline substance is eye small ** a little, and there is a difficulty that the modulation factor of the signal when considering as an optical disk is a little small.

[0063] In order to cancel this difficulty, the optical thickness (nm) of the sum total of the 1st and 2nd up dielectric protective layer 14 and 15 needed to be set up so that the product of this and a refractive index might become 30 or more. Then, it is the 1st up dielectric protective layer 14 ZnS-SiO2 5nm of thickness and the 2nd up dielectric protective layer 15 were made into 9nm of thickness by SiC. For SiC, a refractive index is ZnS-SiO2. It is the large matter with high thermal conductivity. The thermal conductivity of SiC is about 4 W/mK. ZnS-SiO2 Since the refractive index of a refractive index of about 2.0 SiC is about 2.5, 30 or more have been the product of the above-mentioned thickness and a refractive index.

[0064] Ag is [97at(s)% and In of the ingredient of the reflective heat dissipation layer 16] 3at(s)% AgIn (s), and thickness is 140nm. The thermal conductivity of this Ag alloy is about 4 W/mK. About the produced optical disk, initial crystallization was performed using high power laser, and the drive which prepared the optical pickup of 650nm and NA0.6 estimated after that. The signal was modulated 8/16 by 0.267 um/bit track recording density, track pitch 0.74um, and record linear-velocity 8.5 m/s. Moreover, the initial jitter of this optical disk was 6%, and the jitter after 10000 rewritings was as good as 8% or less. In addition, when about 2nm of Bi(s) was formed after membrane formation of the lower dielectric protective layer 12 and the phase change mold recording layer was formed after that, initialization by laser became very easy. It is crystallizing to some extent immediately after membrane formation, and this is considered because laser annealing became simple.

[0065] Example 8 (thing concerning the gestalt of the 2nd operation)
The laminated structure produced the optical disk shown by drawing 2 . Thickness prepared the polycarbonate substrate which is 0.6mm as a plastic plate 11. Magnetron sputtering equipment was used on this substrate, each class was formed, and the optical disk was produced. The ingredient of the lower dielectric protective layer 12 and the 1st up dielectric protective layer 14 was set to ZnS with low thermal conductivity. The thermal conductivity of this ZnS layer is 0.03 W/mK, and thickness is 65nm. It is a spatter in order to harden the film of each class Ar+N2 It carried out in mixed gas.

[0066] the ingredient of the phase change mold recording layer 13 -- Te set and germanium set [Ag /

In / Sb] to 2at(s)% AgInSbTeGe 20at(s)% 73at(s)% 3at(s)% 2at(s)%. Moreover, the thickness is 20nm. The ingredient of this presentation has a quick crystallization rate, and fits high linear velocity record. However, since there is much Sb, there is a difficulty that the optical constant change between an amorphous substance and a crystalline substance is a little small, and the modulation factor of the signal when considering as an optical disk is a little small.

[0067] In order to cancel this difficulty, the optical thickness (nm) of the sum total of the 1st and 2nd up dielectric protective layer 14 and 15 needed to be set up so that the product of this and a refractive index might become 30 or more. Then, it is the 1st up dielectric protective layer 14 ZnS-SiO2 5nm of thickness and the 2nd up dielectric protective layer 15 were made into 10nm of thickness by AlN. AlN is the matter with high thermal conductivity, and thermal conductivity is about 2.5 W/mK. ZnS-SiO2 Since it of a refractive index of about 2.0 AlN is about 2, 30 or more have been the product of the above-mentioned thickness and a refractive index. Moreover, Ag is [97at(s)% and In of the ingredient of the reflective heat dissipation layer 16] 3at(s)% AgIn(s), and thickness is 140nm. The thermal conductivity of this Ag alloy is about 4 W/mK.

[0068] About this optical disk, initial crystallization is performed using high power laser, and it is 650nm after that. The drive equipped with the optical pickup of NA0.6 estimated. Consequently, the signal was modulated 8/16 with 0.267 um/bit track recording density, track pitch 0.74um, and the record linear velocity of 8.5m/s. Record power was peak 14mW and elimination power was 7mW. Moreover, the initial jitter of this disk was 6%, and the jitter after 10000 rewritings was as good as 8% or less.

[0069] an example 9 -- the 2nd up dielectric protective layer 15 was formed by BN, and also the optical disk was produced like the example 7. The thermal conductivity of BN is about 4.5 W/mK. This optical disk of the jitter of 10000 times after was also 10% or less.

[0070] an example 10 -- the 2nd up dielectric protective layer 15 was formed by B4 C, and also the optical disk was produced like the example 7. This optical disk of the jitter of 10000 times after was also 13% or less.

[0071] an example 11 -- the 2nd up dielectric protective layer 15 was formed by TaNx (X is the ratio of the atomic number of Ta and N, and this changes on membrane formation conditions.), and also the optical disk was produced like the example 7. This optical disk of the jitter of 10000 times after was also 15% or less.

[0072] an example 12 -- the 2nd up dielectric protective layer 15 was formed by Au, and also the optical disk was produced like the example 7. This optical disk of the jitter of 10000 times after was also 10% or less.

[0073] The example 13 reflective heat dissipation layer 16 was formed with the AuCu (Cu is 10wt(s)%) alloy, and also the optical disk was produced like the example 7. This optical disk of the jitter of 10000 times after was also 10% or less.

[0074] Example 14 (thing concerning the gestalt of the 3rd operation)
The laminated structure produced the optical disk shown by drawing 3 . That is, with the laminated structure (examples 7-13) shown in drawing 2 , membrane formation sequence produced the reverse optical disk. For this reason, record playback with this optical disk is performed by carrying out incidence of the light from a film surface side. Since the thing of a high scale factor can be used for this type of optical disk as an objective lens, development is furthered as a next-generation high density optical disk.

[0075] Thickness prepared the polycarbonate substrate which is 1.2mm as a plastic plate 21. On this substrate, magnetron sputtering equipment was used, membranes were formed, and the optical disk was produced. The reflective heat dissipation layer 22 was formed first. Ag is [97at(s)% and In of the ingredient of this reflective heat dissipation layer] 3at(s)% AgIn(s), and thickness is 140nm. The thermal conductivity of this Ag alloy is about 4 W/mK. In addition, Ag alloy has good front-face nature compared with aluminum alloy (surface smoothness is high). Since all film is formed on the reflective heat dissipation layer 22, since that the front-face nature of Ag is good leads also to the smoothness of the phase change mold recording layer 25, as for the disk of this configuration, a property becomes still better. In this semantics, although an AgPd alloy is expensive, the optical disk of a still better property is

producible.
[0076] The 1st lower dielectric protective layer 23 which consists of SiC on the reflective heat dissipation layer 22 was formed by 10nm of thickness. The 2nd lower dielectric protective layer 24 which moreover consists of ZnS-SiO2 (ZnS is 80-mol % and SiO2 is 20-mol %) was formed by 5nm of thickness. Furthermore, Ag formed the phase change mold recording layer 25 which Sb becomes [In] 5at(s)% and germanium becomes [Te] from 2at(s)% AgInSbTeGe 20at(s)% 71at(s)% by 20nm of thickness 2at(s)%. The up dielectric protective layer 26 which becomes the last from ZnS-SiO2 (ZnS is 80-mol % and SiO2 is 20-mol %) was formed by 40nm of thickness.
[0077] Furthermore, the resin cover layer 27 which consists of ultraviolet-rays hardening resin on the up dielectric protective layer 26 was formed. In this case, the spin coat of the ultraviolet-rays hardening resin was carried out, and it was made to harden with an ultraviolet ray lamp. In addition, if ultraviolet rays are irradiated after carrying out a spin coat, the resin of the outermost periphery of an optical disk will rise and thickness unevenness will arise. So, in this example, after 90% of spin time amount passed in the spin of a substrate, ultraviolet rays were irradiated, continuing substrate spin. The unevenness of the spreading thickness of the resin of the outermost periphery was suppressed by carrying out like this. Thereby, with this optical disk, since the aberration of light became small, record playback was able to be carried out with the recording density same to the outermost periphery.
[0078] The drive which performed initial crystallization about this optical disk using high power laser, and was equipped with the wavelength of 650nm and the optical pickup of NA0.8 after that estimated. Consequently, the signal was modulated 8/16 with 0.21 um/bit track recording density, track pitch 0.6um, and the record linear velocity of 8.5m/s. Record power was peak 12mW and elimination power was 6mW. Moreover, the initial jitter of this optical disk was 7%, and the jitter after 10000 rewritings was as good as 10% or less.
[0079] an example 15 -- the ingredient of the 1st lower dielectric protective layer 23 was set to AlN, and also the optical disk was produced like the example 14. The jitter of 10000 times after in this optical disk was 10% or less.
[0080] an example 16 -- the ingredient of the 1st lower dielectric protective layer 23 was set to BN, and also the optical disk was produced like the example 14. The jitter of 10000 times after in this optical disk was 10% or less.
[0081] an example 17 -- the ingredient of the 1st lower dielectric protective layer 23 was set to B4 C, and also the optical disk was produced like the example 14. The jitter of 10000 times after in this optical disk was 13% or less.
[0082] an example 18 -- the ingredient of the 1st lower dielectric protective layer 23 was set to TaNx, and also the optical disk was produced like the example 14. The jitter of 10000 times after in this optical disk was 14% or less.
[0083] The example 5 (refer to drawing 2) of a comparison
The optical disk was produced like the example 7. However, it differed in the example 7, the up dielectric protective layer was used as the monolayer which consists of ZnS-SiO2 (ZnS/SiO2 =80 mol %/20 mol %), and the thickness was set to 18nm. Although the jitter of the obtained optical disk got worse only about 1% compared with the example 7, Ag reflective film carried out sulfuration degradation of it.
[0084] The optical disk was produced like example of comparison 6 example 7. However, it differed in the example 7, the up dielectric protective layer was used as the monolayer which consists of SiC, and thickness was set to 18nm. In this optical disk, it was [the initial jitter] bad and there was 10%. Although there were few jitter rises of repeat rewriting, since it was oversized from the beginning, it was not practical. The process that this shuts up heat and quenches it after that by some time amount and the 1st up dielectric protective layer first, and the device show that it is the need to low jitter-ization.
[0085] The optical disk was produced like example of comparison 7 example 7. However, it differed in the example 7 and the reflective heat dissipation layer was used as the AlTi alloy (Ti is 1wt%). This optical disk was [the initial jitter] bad, and had 10%. The jitter after 5000 times rewriting reached to 16%. The thermal conductivity of a reflective heat dissipation layer worsens, the temperature of record

film goes up and this becomes feeling, and since defects, such as membrane flow, arose a little early, it is considered.
[0086] The optical disk was produced like example of comparison 8 example 7. However, it differed in the example 7, the up dielectric protective layer was formed by SiO, and thickness was set to 18nm. Moreover, the reflective heat dissipation layer was formed with the AlTi alloy (Ti is 1wt%). The initial jitter of this optical disk was good, and was 7%. However, the jitter after 10000 times rewriting was 16% or more. although, as for this result, the direction which lowered heat conduction of an up dielectric protective layer shows [the jitter] that it becomes good when the heat conductivity of a reflective heat dissipation layer is 3 or less W/mK -- the limitation of over-writing -- a reflective heat dissipation layer -- high temperature -- getting worse than the case, ****, is shown.
[0087]
[Effect of the Invention] By the above explanation, according to this invention (the 1st invention), the sputtering time amount of a lower dielectric protective layer becomes short so that clearly, and the thermal stress to a substrate decreases. For this reason, it is possible to be able to produce an optical recording medium under a quicker baton, and to offer the optical recording medium of low cost.
[0088] Moreover, with the optical recording medium concerning this invention (the 2nd invention, the 3rd invention), it is a protective layer between a phase change mold recording layer and a reflective heat dissipation layer (). [up dielectric protective layer] or a lower dielectric protective layer -- 2 -- dividing -- the latest of a phase change mold recording layer -- a thermal break -- forming -- heat -- short-time closing ****** -- by making it like, forming the layer of high temperature conductivity after that, and forming the layer of high temperature conductivity as a reflective heat dissipation layer further The maximum temperature of a phase change mold recording layer is stopped, and it is made feeling, and is effective in the ability to lengthen the count of repeat rewriting. Furthermore, though the highest attainment temperature is suppressed for a thermally conductive good reflective heat dissipation layer and it is made feeling, since the big temperature gradient of amorphous-izing at the time of record can be made, aggravation of record sensibility is suppressed and it is effective in the ability to perform record playback of a low jitter.

[Translation done.]